Managerial Overconfidence and the Buyback Anomaly

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Abstract

While positive, long-run abnormal returns following share repurchase announcements are substantially lower when CEOs are overconfident. This effect is particularly strong for (i) difficult to value firms, such as small, young, non-dividend paying, distressed, and having negative earnings firms, (ii) firms with poor past stock return performance and high book-to-market ratio, indicators of possible overreaction to bad news, and (iii) financially constrained firms. Overall, these results are consistent with the mispricing hypothesis as a motive for repurchases and as an explanation for the buyback anomaly. Additionally, irrespective of the CEO's level of confidence, abnormal returns are considerably larger for financially constrained firms, implying their managers require larger undervaluation due to the higher cost of capital.

Key Words: Share repurchase, buybacks, overconfidence, asymmetric information, abnormal returns
JEL classification: G14, G32, G35

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1. Introduction

The buyback anomaly is one of the most persistent and difficult to explain stock market anomalies. Ikenberry, Lakonishok, and Vermaelen (1995, 2000) find positive long-run abnormal returns for a period of up to 48 months following share repurchase announcements. Several explanations have been proposed for the buyback anomaly. Vermaelen (1981, 1984), Chan, Ikenberry, and Lee (2004), and Peyer and Vermaelen (2009) argue that mispricing drives the anomaly. Specifically, these authors suggest that the buyback anomaly is a consequence of a correction to overreaction to bad news. By announcing a stock repurchase, managers either try to signal to the market the undervaluation or try to time the market. Grullon and Michaely (2004) argue that changes in the cost of capital following repurchase announcements drive the post-buyback high abnormal returns. Another explanation is the liquidity hypothesis: when firms repurchase stock, they reduce their liquidity. If a liquidity level or liquidity risk are priced (Amihud and Mendelson, 1986; Pástor and Stambaugh (2003), Acharya and Pedersen (2005), then the abnormal returns could be due to the liquidity level or the omission of a liquidity factor in the empirical tests.

Our paper's contribution is twofold. First, we test the mispricing hypothesis. If undervaluation is the motive behind share repurchases, then the long run abnormal returns will be different when the managerial signals to the market are likely to be true than when the signals are likely to be biased due to managerial overconfidence. That is, we hypothesize that the post-repurchase announcement long-run abnormal returns of overconfident CEOs are on average lower. Our empirical findings confirm this hypothesis. This finding extends the literature that examines the relation among share repurchase intensity, short run abnormal returns post buyback announcements, and managerial overconfidence.

Second, we test whether the difficulty to value stocks affects the role of managerial overconfidence in the post buyback anomaly. Baker and Wurgler (2006) show that difficulty of valuation is key to the impact of investor sentiment on stock prices. That is, the valuations and returns of difficult to value stocks are substantially more affected by investors' positive and negative sentiments. Given this, we ask whether difficult to value stocks are also the most affected by managers' misvaluation stemming from overconfidence. We find that managerial overconfidence matters for the buyback anomaly only when firms are difficult to value.

Why do we expect the post share repurchase announcements long-run abnormal returns to be lower when managers are overconfident? First, extant literature suggests that overconfident CEOs perceive the stock of their company to be undervalued by the market (Malmendier and Tate, 2005a). Hence, overconfident managers are more likely than underconfident managers to believe that the stocks are underpriced, even when the stock is actually not underpriced. Repurchasing a non-underpriced stock would lead to lower long-run abnormal returns relative to the case when the stock is indeed underpriced.

Second, even if the stocks are indeed underpriced it might still not be optimal for the firm to repurchase them for the following reason. If share repurchase occurs when the shares are undervalued, then staying shareholders benefit from wealth transfer at the expense of outgoing shareholders. However, by repurchasing stocks, a firm may also suffer costs; for instance, reduced financial slack and liquidity, and loss of shareholder base.[3] Overall, the magnitude of undervaluation dictates a trade-off between benefits and costs of stock repurchase and determines long-run abnormal returns. That is, the undervaluation has to be above a certain threshold for the repurchase to be profitable. Overconfident managers overestimate the degree of mispricing and hence are likely to sometime undertake repurchases when the costs outweigh the benefits, leading to lower average long-run abnormal returns for these managers. Thus, for a given level of undervaluation, we expect lower abnormal returns when the CEO is overconfident.

We divide the announcing firms according to the degree of confidence of their CEOs and test whether long-run abnormal returns are different when CEOs are overconfident. We employ three prominent measures of CEO overconfidence. Our primary measure is a *press-based* measure of CEO overconfidence following Malmendier and Tate (2005a, 2008), Hirshleifer, Low, and Teoh (2012) and Hribar and Yang (2015). The press-based measure employs count of words relating to managerial overconfidence (or its opposite) in proximity to the company name and the keyword "CEO". As robustness checks, we employ two additional measures. First, we use the *longholder* measure based on late option exercise behavior (see, e.g., Malmendier and Tate, 2008; Malmendier, Tate, and Yan, 2011). The options exercise measure builds on the idea that a CEO who chooses to be exposed to the firm's idiosyncratic risk by delaying option exercise is likely to be overconfident about the firm's prospects. Second,

[3] This implies that the minimum level of underpricing that triggers a repurchase is not zero.

we divide the sample by the gender of the executive team, and the gender of the CEOs and CFOs. This measure builds on the fact that men have been found to show a heighten overconfident behavior than women (Barber and Odean, 2001; Niederle and Vesterlund, 2007; Dahlbom, Jakobsson, Jakobsson, and Kotsadam, 2011; and Huang and Kisgen, 2013).

Using a sample of share repurchases that covers the period 1992 through 2009, we find that firms with overconfident CEOs earn substantially lower post-announcement long-run abnormal returns than firms with underconfident CEOs. Specifically, firms with underconfident CEOs earn a 48-month cumulative abnormal return of 27.80 percent, whereas firms with overconfident CEOs earn only 17.39 percent return.[4] Consistent with the mispricing hypothesis for share repurchases, this finding suggests that at the buyback announcement time, the shares of firms with overconfident managers are, on average, less undervalued than the shares of underconfident managers. Thus, it appears that there are more overconfident CEOs who announce stock repurchases when the undervaluation, if any at all, is not enough to compensate the costs of the repurchase, and therefore the overall effect is lower than for announcing firms with underconfident CEOs. In other words, while in both groups of firms there will likely be CEOs that misjudge the undervaluation of their firms, the fraction of misjudging CEOs will be larger for the group of firms with overconfident CEOs, and the overall cumulative abnormal returns will be lower for this group of firms.

Interestingly, while the abnormal returns post repurchase announcements are lower when CEOs are overconfident, they are still significantly positive. Hence, although overconfident managers tend to exaggerate the degree of mispricing, there is still a significant number of overconfident CEOs that correctly appraise the undervaluation of their stocks, or that although they exaggerate the undervaluation, it actually exists and is sufficiently high to render the repurchase profitable in spite of potential costs. Thus, on average, overconfident managers are still valuing the company better than the market. At least two reasons could potentially account for this. First, managers (including overconfident managers) likely have

[4] The difference in abnormal returns between stocks of firms with overconfident CEOs and stocks of firms with underconfident CEOs becomes economically significant only after two years. This finding is similar to Peyer and Vermaelen (2009), who find that poor past performers begin to outperform other announcing firms only after approximately two years. Peyer and Vermaelen (2009) attribute the late outperformance to mistakes made by analysts. Specifically, according to the analyst mistake hypothesis, the repurchase announcement is a response of the company to a mistake made by financial analysts. As analysts are unlikely to admit they made a mistake, a repurchase announcement receives no support from analysts. If analysts do not change their published opinions after the repurchase, stocks may remain undervalued for an extended period of time.

more information about the company than the market, enabling them to spot underpricing of their own firms' stocks. Second, the market, realizing that the CEO is overconfident and is prone to undertaking negative NPV real investment projects, could view repurchases by overconfident CEOs positively, or at least less negatively, as free cash flow is reduced and the agency cost induced by free cash flows alleviated (Jensen, 1986). Indeed, overconfident CEOs tend to overestimate project value and underestimate project risk. Malmendier and Tate (2005b) find that overconfident managers overestimate the returns to their investment projects and view external funds as unduly costly. Thus, they overinvest when they have abundant internal funds. Ben-David, Graham, and Harvey (2013) indicate that many executives have miscalibrated risk/return distributions. These traits of overconfident CEOs likely cause them to undertake negative NPV physical investment projects at times.

In order to test the effect of the difficulty to value on the role of managerial overconfidence in the buyback anomaly, we divide the announcing firms according to how difficult they are to value. Baker and Wurgler (2006) argue that small, young, non-dividend paying, distressed, and unprofitable firms are more difficult to value. Thus, we divide repurchase events into different categories based on these firm characteristics. As expected, the results show that for young, and non-dividend paying firms, the long-run underperformance of stocks of firms with overconfident CEOs relative to stocks of firms with underconfident CEOs, is economically larger and statistically significant.[5] Interestingly, when valuation is not difficult, there is no statistically significant difference in the long-run abnormal returns of repurchases announced by overconfident and underconfident CEOs.

Further, we also investigate the interaction between the CEO overconfidence effect and the relationship between share repurchases and a firm's financial constraint status. This interaction is particularly interesting because, generally, due to financing costs, managers of financially constrained firms might be more reluctant to repurchase; this implies that a larger undervaluation is required to proceed and repurchase. While this is true for underconfident CEOs, for overconfident CEOs the decision to repurchase is complicated by the fact that overconfidence has implications for both financing costs (which deters repurchases) and undervaluation (which advances repurchases) (Malmendier and Tate (2005b)). We divide firms using four different common measures of financial constraints, the Whited and Wu (2006)

[5] We find similar results for firms with negative earnings. However they are not statistically significant, possibly due to a small number of observations.

index, the Hadlock and Pierce (2010) size and age measure, the Kaplan and Zingales (1997) index and firm size. The results show that stocks of firms that are financially constrained and have overconfident CEOs underperform relative to stocks of firms managed by underconfident CEOs. This finding suggests that decisions of overconfident CEOs to repurchase are affected more by their perception about their firms' undervaluation rather than financing costs.

We also find that when firms are financially constrained, stocks of firms with both overconfident and underconfident CEOs earn substantially higher average abnormal returns than when firms are financially unconstrained. A potential explanation for this finding is that the cost of repurchase is higher when firms are financially constrained. Consequently, financially constrained firms announce buybacks when their stocks, on average, are more undervalued. This result differs from Chen and Wang (2012), who find that the characteristics-adjusted long-run abnormal returns are poorer for financially constrained firms, but is consistent with Peyer and Vermaelen (2009) who find that small firms earn substantially higher abnormal returns following announcements. We note that firms' market capitalization is a well-known indicator of the degree firms are financially constrained (see, for example, Hadlock, and Pierce, 2010).

Finally, we also investigate the relation between CEO overconfidence and the fraction of shares bought back at the announcement time. The results show that this fraction is substantially higher when CEOs are overconfident. This finding is consistent with the conjecture that overconfident CEOs perceive their company stocks as undervalued by the market.

Several reasons for repurchasing stock are given in the literature. One explanation is that share buyback is a way of distributing free cash flow in case of lack of good investment opportunities, and therefore a tool to diminish the agency costs of free cash flows, as argued by Jensen (1986). Stephens and Weisbach (1998) find a positive correlation between repurchases and the level of cash flows, consistent with this explanation. Another possible reason for a stock repurchase can be a restructuring of the capital structure of the firm. This is especially so in the case of the repurchase being largely funded through debt. Bagwell and Shoven (1988) and Opler and Titman (1994) discuss and show the impact that repurchasing stock has on leverage. The results of these papers indicate that firms may repurchase stocks to increase their leverage ratio. Bagwell (1991) explains how firms use repurchases to fend off unwanted takeover attempts and

Jolls (1996) and Fenn and Liang (1997) illustrate that firms use repurchases to counter the dilution effects of employee and management stock options. A third possible reason for share buybacks is that a stock repurchase is a tool to transfer wealth from debtholders to stockholders since the amount of wealth remaining in the firm is reduced and therefore, debtholders are more damaged in case of liquidation (Dhillon and Johnson, 1994; Maxwell and Stephens, 2003). Finally, a reason for repurchasing stock might be to exploit information asymmetries between insiders and outsiders. Vermaelen (1981, 1984) studies repurchases and argues that management uses its inside informational advantage to buy back the shares of their own firms when they consider these to be undervalued. This signals the mispricing to the market and, after the repurchase announcement, the market takes corrective action pushing the stock price upwards. Dittmar (2000) finds that the dominant motivation for share repurchases is to take advantage of potential undervaluation. Brav, Graham, Harvey, and Michaely (2005) conduct a survey among a large number of financial executives. The executives surveyed say that they accelerate (or initiate) share repurchases when the company's stock price is low by recent historical standards. The most popular response for all repurchase questions on the survey is that firms repurchase when their stock is a good value, relative to its true value. This is consistent with the explanation given by Vermaelen (1981, 1984). Our paper relates to Vermaelen's signaling hypothesis since we use the informational content of the signal sent by the management when announcing stock repurchases. Overconfident managers send a less credible signal and the market does not react in the same way as it reacts after a more credible signal sent by underconfident managers.

The rest of the paper is organized as follows. Section 2 elaborates on our contribution to the literature. Section 3 describes the data. Section 4 details our empirical methodology. The results are presented in Section 5 and Section 6 concludes.

2. Contribution to the literature

Our paper contributes to the literature in several aspects. First, it expands our understanding of the buyback anomaly. While a number of potential explanations for the anomaly have been suggested in the literature, namely the change in cost of capital explanation (Grullon and Michaely, 2004), the liquidity hypothesis based on the pricing of liquidity (Peyer and Vermaelen , 2009), and the mispricing hypothesis (Chan, Ikenberry, and Lee, 2004; Peyer and Vermaelen, 2009), our finding that the cumulative abnormal returns of announcing firms under

overconfident managers underperform is consistent with the latter hypothesis. Overconfident CEOs tend to perceive their company shares as being undervalued and thus may engage in repurchase activities even when their stocks are not undervalued or when the extent of the undervaluation is not large enough to compensate the by costs of the stock repurchase. The market interprets the signal as driven by mere overconfidence and, on average, abnormal returns after announcements by overconfident CEOs are lower than for underconfident CEOs. Underconfident CEOs, however, only announce a repurchase based on more objective assessments of the stock misvaluation. The market, thus, reacts accordingly to the signal and the average abnormal returns are higher. These results empirically support Chan, Ikenberry, and Lee (2004) and Peyer and Vermaelen (2009) explanation of mispricing driving the anomaly.

It is important to note that we do not argue that overconfident CEOs only announce repurchases when their stocks are not undervalued. In fact, the positive abnormal returns following repurchase announcements of overconfident CEOs is an indication that, on average, overconfident CEOs announce repurchases when their stocks are truly underpriced. Thus, our claim is that the likelihood of a repurchase announcement when the stock is not underpriced is higher when the CEO is overconfident than when the CEO is underconfident. The relative underperformance of stocks of firms with overconfident managers following repurchase announcements provides empirical support for our claim.

Second, we extend the burgeoning literature that investigates the influences of managerial overconfidence on firms' policies. In this vein, Malmendier and Tate (2005b) show that firms with overconfident CEOs exhibit high investment-cash-flow sensitivity. Overconfident CEOs have also been found to engage intensively in unsuccessful mergers and acquisitions (Malmendier and Tate, 2008), and avoid tapping the capital markets (Malmendier, Tate, and Yan, 2011). In addition, Ben-David, Graham, and Harvey (2013) find that firms with overconfident CFOs invest more, tolerate higher financial leverage, pay out fewer dividends, use more long-term debt than short-term debt and engage in market timing activity. We expand this literature by showing that CEO overconfidence affects firms' stock performance especially when valuation is difficult and subjective. Particularly, our findings indicate that the effect of managerial overconfidence on the post-buyback abnormal returns is substantially higher for small firms, non-dividend paying firms, and young firms. Overconfident CEOs in such firms know that outsiders have more difficulty to appraise the true value of these firms, and tend to

disregard the information given by the market price. These managers tend to use their personal and biased appraisals of their own firms and are more likely to infer that the market price is too low. Underconfident CEOs, on the other hand, use every piece of information available in order to assess the value of their firms' stocks and only announce stock repurchases when they are almost certain that their stocks are truly underpriced. Consistent with this conjecture, we find a large difference between the cumulative abnormal returns after stock repurchases announced by firms under overconfident and underconfident CEOs when firms are difficult to value. If firms are easier to value, overconfident CEOs are likely to consider the market price as more informative and this reduces the likelihood of overvaluation. Therefore, the difference between the abnormal returns after stock repurchase announcements by overconfident and underconfident CEOs is largely diminished for firms that are easier to value. For example, analyst coverage of small firms is substantially lower than that of large firms, making valuation mistakes by investors more likely. While the post-buyback abnormal returns of small stocks with overconfident CEOs is positive (implying that investors sometimes underprice these stocks), it is substantially lower than the post-buyback abnormal returns of small firms with underconfident CEOs, implying that overconfident managers often overvalue their stocks. This conclusion is further supported by our finding that the effect of overconfidence is stronger for firms with poor past performance and high book-to-market firms. These firms are more likely to be considered as undervalued by their CEOs when CEOs are overconfident even in the case that the market is correct, whereas underconfident CEOs tend to be more objective about the undervaluation, and announce repurchases when they are more certain that their firms' stocks are indeed undervalued and that the undervaluation is of enough magnitude to compensate the costs of the repurchases.

More specifically, our paper contributes to the literature that examines the relation between managerial overconfidence and share repurchases. Andriosopoulos, Andriosopoulos, and Hoque (2013) analyze data from UK regulatory and disclosure environment and document that overconfident CEOs perceive their shares as undervalued and have a higher buyback completion rate. Similarly, Shu, Yeh, Chiang, and Hung (2013), using data from Taiwan, document that managerial overconfidence is positively correlated with the intensity of share repurchasing. Further, these authors conduct a short-run event study and conclude that for repurchase programs launched by overconfident managers, company shares were not undervalued and, therefore, were associated with reduced 3-month post-announcement returns. Our main contribution relative to these papers is to show that managerial overconfidence

matters for share repurchases only when firms are difficult to value. This result is important because it highlights the interaction between managers' traits and the uncertainty faced by investors in valuation. Moreover, we study long-term stock performance, in accordance with Ikenberry, Lakonishok, and Vermaelen (1995), and Peyer and Vermaelen (2009), whereas Shu, Yeh, Chiang, and Hung (2013) study the market's reaction up to three months following the announcement. In a contemporaneous paper to ours Banerjee, Humphrey-Jenner, and Nanda (2018) show that overconfident CEOs are more prone to repurchase shares and the stock market's reaction to their share repurchase announcement is less positive. These authors, however, do not explore how the difficulty to value firms affects the relationship between managerial overconfidence and share repurchase long-run abnormal returns. Baker and Wurgler (2006) show that the difficulty of firm valuation is key to the impact of investor sentiment on stock prices. As such, our study offers complementary evidence because it suggests that the difficulty to value firms exacerbates the effects of managerial overconfidence on a major corporate policy, namely share repurchases. We also explore the effect of financial constraints on the abnormal returns following share repurchase announcements, and the interaction between financial constraints and managerial overconfidence, whereas none of the papers mentioned above explores these. The findings indicate that managers are more prudent in share repurchase decisions when their firms are financially constrained.

3. Data and variables

We use several data sources in our study. We obtain the sample of common stock repurchases from the Securities Data Company (SDC) US mergers and acquisitions and repurchase database. Our sample period covers the period 1992 through 2009 and includes 16,025 repurchase announcements. For stock returns, we use the Center for Research in Security Prices (CRSP) database. We require a firm to have at least 36 months of stock return data prior to the announcement to be included in the sample. Accounting information is from Compustat while executive compensation and gender-related data are from ExecuComp. The data for the Fama and French three factors and momentum are obtained from Kenneth French's website.

Table 1 reports descriptive statistics for firms that announced stock repurchases. We exclude those events where there was an earlier repurchase announcement by the same company within 1 month. Table 1 then divides the sample into repurchases announced by

overconfident CEOs and repurchases announced by underconfident CEOs following the Hirshleifer, Low, and Teoh (2012) confidence indicator.

3.1 Managerial overconfidence measures

We use three measures for managerial overconfidence. First, we employ a press-based measure following prior studies (i.e., Malmendier and Tate (2005a, 2008); Hribar and Yang (2015); and Hirshleifer, Low, and Teoh (2012)). To operationalize this measure, we search Factiva for articles referring to the CEO in The New York Times, BusinessWeek, Financial Times, The Wall Street Journal, The Economist, Fortune, and Forbes. We identify all articles using the available unique company code in Factiva and the search keyword "CEO". For each CEO and year, we record (1) the total number of articles, (2) the number of articles containing the words "confident", "confidence", or variants such as overconfidence and overconfident, (3) the number of articles containing the words "optimistic", "optimism", or variants such as overoptimistic and over-optimism, (4) the number of articles using "pessimistic", "pessimism", or variants such as over pessimistic, and (5) the number of articles using "reliable", "steady", "practical", "conservative", "frugal", "cautious", or "gloomy". Category 5 also contains articles in which "confident" and "optimistic" are negated. The sample is divided into two groups: firms with overconfident CEOs and firms with underconfident CEOs. For every year, a CEO is classified as overconfident if the number of articles using the confident terms is larger than the number of articles using the pessimistic terms. A CEO is classified as underconfident if the number of articles including pessimistic terms surpasses the number of articles including the optimistic terms. Note that from all the firms that announce a repurchase, we only have information about the degree of confidence of those CEOs that are referred to in articles available in Factiva. Therefore, we can only divide the sample between overconfident CEOs and underconfident CEOs. We cannot say anything about non-overconfident CEOs since this group would include all CEOs for which there is not a match in Factiva and therefore, it would contain both overconfident CEOs and underconfident CEOs that were simply not named.

Second, we use an options-based measure for managerial overconfidence. Specifically, we use a longholder measure based on the CEOs' option exercise behavior (see, e.g., Malmendier, and Tate, 2008; Malmendier, Tate, and Yan, 2011). Longholder builds on the idea that preferences of risk-averse CEOs' not to exercise stock options timely, even though the underlying stock price exceeds rational exercise thresholds (Hall and Murphy, 2002), is likely

to reveal personal beliefs about their firms' future performance. Thus, a CEO is classified as overconfident when she holds an option until the year of expiration, even though the stock option is at least 40% in-the-money entering its final year. Specifically, we exploit information about all outstanding options held by a CEO that are directly observable starting in 2006 due to requirements from the FAS 123R and we identify CEOs who, at least once during the period 2006-2013, hold an option until the year of expiration, even though the stock option is at least 40% in-the-money entering its final year. Since a typical option has 10 years' duration and is fully vested by the fifth year, the longholder measure likely captures habitual, rather than time-varying, failure of CEOs to diversify across several years, starting from 1996. Accordingly, we back filled the classifications of each CEO during her entire tenure for the period 1992-2009. Finally, CEOs that never exercise options do not reveal beliefs and, thus, we exclude them from the sample.

Third, we use a gender-based measure for managerial overconfidence. Barber and Odean (2001) analyze the common stock investments of more than 35,000 households and report that men trade 45% more than women. They argue that this excess trading is due to overconfidence. Differences in confidence between genders are also reported by Niederle and Vesterlund (2007). Specifically, these authors find that male overconfidence can be a key factor in explaining the higher degree of willingness to compete shown by men. This can reflect in differences in selection of compensation schemes and in the underrepresentation of women in top-level firm positions. Huang and Kisgen (2013) find that male executives undertake more acquisitions and issue more debt than female executives. They also find that investors react more favorably to significant corporate decisions made by firms with female executives. Empirically. we divide our sample in several ways according to the Execucomp's gender classification of executives. First, we divide the announcing firms into two groups according to whether all the executives were males or there were females on the executive team. Second, we divide the announcing firms according to whether any of the CEO or CFO are males versus at least one of them is a female.[6] Finally, we divide the announcing firms according to whether the CFO is a male or a female.

3.2 Financial constraint and book-to-market measures

[6] Similar to Jian, Petroni, and Wang (2010), we identify CEOs and CFOs using ExecuComp's classification (data item CEOANN=CEO and TITLEANN contains any of the following words: CFO, chief financial officer, treasurer, controller, finance, and vice president-finance, respectively).

We use four different measures of financial constraints commonly employed in recent literature, namely the Whited and Wu (2006) WW index, the Hadlock and Pierce (2010) size and age SA measure, the Kaplan and Zingales (1997) KZ index, and firm size where size is measured as the market value of common equity. Firms with higher WW index, higher SA index, higher KZ index, and smaller firms are more financially constrained.

We calculate the book-to-market ratio as the book value of assets divided by the market value of assets, where the market value of assets is calculated as the book value of assets minus the book value of common equity plus the market value of common equity.

Table 2 presents descriptive statistics for non-announcing firms, defining these as those companies that did not announce any stock repurchase during the specific year. Announcing firms tend to be more constrained than non-announcing firms by every one of our constraint measures. This does not support the explanation of firms repurchasing stock to distribute free cash flow to reduce their agency costs. Moreover, announcing firms tend to have higher book-to-market ratios, indicating that these firms are likely to be undervalued and that the management uses the repurchase announcement as a means of signaling the misvaluation to the market.

4. Methodology

To investigate whether firms have long-run abnormal returns after the announcement of open market repurchases, we follow Peyer and Vermaelen (2009) and use the Fama-French (1993) three-factor model with momentum as an additional factor (known as the Carhart (1997) four-factor model) combined with Ibbotson's RATS methodology to calculate the abnormal returns. In this methodology, security excess returns are regressed on the four factors for each month in event time, and the estimated intercept represents the monthly average abnormal return for each event month. We consider long-run abnormal returns between 1 month and 48 months after the announcement of the open market repurchase program.

The sample is then divided into two groups, one having overconfident CEOs, and the other with underconfident CEOs. The following cross-sectional regression is run each event

month *j* (*j=0* is the event month in which the open market repurchase is announced, *j=1* to *j=48* are the 1st month to the 48th month after the announcement) for each group:

$$R_{i,t} - R_{f,t} = a_j + b_j(R_{m,t} - R_{f,t}) + c_j SMB_t + d_j HML_t + e_j MOM_t + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is the monthly return on security *i* in the calendar month *t* corresponding to event month *j*. $R_{f,t}$, $R_{m,t}$, SMB_t, HML_t, and MOM_t are the risk-free rate, the return on the equally weighted CRSP index, and the monthly returns on the size, book-to-market and momentum factors in the calendar month *t* corresponding to event month *j*, respectively. The coefficient a_j is the result of a monthly cross-sectional regression. We get 12, 24, 36 and 48 monthly estimates of these a_j -depending on the length of the horizon we are exploring. Then, 12-, 24-, 36- and 48-month cumulative abnormal returns (CARs) are calculated as the sum of the a_j over the relevant period of time. The standard error for a given event window is the square root of the sum of squares of the monthly standard errors.

Based on our argumentation, the effect of overconfidence on the long-run abnormal returns following buyback announcements is expected to vary with the difficulty associated with firm valuation, therefore we divide the firms into groups on the basis of firm characteristics that proxy for this difficult-to-value attribute. Then, within each difficult-to-value group, we further classify firms according to the level of managerial overconfidence at the time of the repurchase announcement.

In more detail, we divide firms according to age, and their dividend payment status.[7] Baker and Wurgler (2006) suggest that young firms are more difficult to value.[8] A firm is classified as young if it appears at CRSP for less than 72 months before the announcement and as an old firm if it appears for more than 241 months before the announcement. Baker and Wurgler also posit that non-dividend-paying firms and unprofitable firms are more difficult to value being more exposed to fluctuations in investors' sentiment. We, therefore, divide our sample according to these two criteria. A firm is classified as a payer if it pays dividends in the year previous to the repurchase announcement, and as a non-payer if it does not pay dividends. A firm is classified as profitable if it has positive earnings in the year previous to the

[7] We also divide firms according to whether they have positive earnings, or zero or negative earnings. We do not report the results because there are too few observations among firms with zero or negative earnings.
[8] Young firms are followed by fewer specialists, and therefore they are more unknown to the different agents in the economy. This implies that they are more difficult to value for investors.

announcement, and as non-profitable if it reports zero or negative earnings, where earnings are defined as income before extraordinary items plus depreciation and amortization.

Following Peyer and Vermaelen (2009), we identify announcing firms that are likely to be undervalued by the market.[9] We separate the firms according to their 6-month stock performance before the repurchase announcement. A firm is classified as a good performer if its cumulative return for the 6 months before the announcement is above the 75 percentile of the cumulative returns of all firms that announce a stock repurchase. A firm is classified as a poor performer if its cumulative return is below the 25 percentile. We also divide the announcing firms according to their book-to-market ratios as in Ikenberry, Lakonishok, and Vermaelen (1995). These authors argue that value stocks (i.e., high book-to-market ratio) are more likely to be undervalued. A firm is classified as high book-to-market if, in the year previous to the announcement, its book-to-market is above the 75 percentile of all the firms that announce a repurchase. A firm is classified as low book-to-market if it is below the 25 percentile.

Further, we divide the sample by using four measures of financial constraints, the WW index, firm size, the SA index, and the KZ index. We classify a firm as being financially constrained if it belongs to the top 25 percentile of the WW index, to the lowest 25 percentile according to size, to the top 25 percentile of the SA index, or top 25 percentile in the KZ index in the year before the announcement. A firm is classified as financially unconstrained if it belongs to any other percentile with the exception of when using size as a constraint measure, in which case a firm is classified as unconstrained if it belongs to the top 25 percentile.

We finally test whether overconfident CEOs also announce a larger fraction of shares to be repurchased, by running the following cross-sectional regression:

$$\begin{aligned} Fraction_i = {} & \beta_0 + \beta_1 Confidence_i + \beta_2 EqSize_i + \beta_3 BM_i + \beta_4 PriorRet_i + \\ & + \beta_5 Profitability_i + \beta_6 (DIV / BE)_i + \varepsilon_i \end{aligned} \tag{2}$$

[9] Peyer and Vermaelen (2009) show that stocks experience larger positive long-run excess returns if the repurchase follows a severe stock-price decline in the previous 6 months to the announcement. This finding strongly supports the mispricing hypothesis. They argue that the long-run excess returns are a correction of an overreaction to bad news prior to the announcement. If this is the case, then distinguishing between good and bad previous performers is an ideal setting for our confidence indicator.

where $Fraction_i$ is the fraction of the issued stock announced to be repurchased in event *i*, $Confidence_i$ is our overconfidence indicator calculated as in Hirshleifer, Low, and Theo (2012) for the CEO of the firm related to event *i*, $EqSize_i$ is the market value of common equity of the announcing firm in the year previous to the announcement, BM_i is the ratio of the book value of equity to the market value of equity in the year previous to the announcement, $PriorRet_i$ is the 6-month cumulative stock return for the six months preceding the announcement of event *i*, $Profitability_i$ is the ratio of income before extraordinary items plus depreciation and amortization to shareholders equity plus balance sheet deferred taxes in the previous year to the announcement of *i*, and DIV/BE_i is the ratio of total dividends to book equity defined as the shareholders equity plus balance sheet deferred taxes in the year preceding the announcement. We estimate this equation using OLS with clustered at the firm level standard errors. We expect to find a significant and positive coefficient for the variable *Confidence*, implying that overconfident CEOs announce larger repurchase fractions, consistent with our argument of overconfident CEOs viewing their stocks as underpriced by the market.

5. Results

We start the presentation of our results by showing the overall effect of overconfidence in the cumulative abnormal returns following repurchase announcements. Table 3 reports the abnormal returns for all the firms on the SDC database that announce a repurchase and then for those that we classify as having overconfident CEOs and underconfident CEOs using our press-based overconfidence indicator. We can see that the repurchase anomaly is still persistent up to 2009. The average abnormal return after 48 months following an announcement is 25.12 percent statistically significant at the 1 percent level. We also observe that underconfident CEOs earn higher returns than overconfident CEOs, and the difference is economically large and statistically significant after 48 months. Specifically, the average cumulative abnormal return after 48 months following a repurchase announcement is approximately 10 percentage points larger if the announcement is made by a firm with an underconfident CEO than if made by a firm with an overconfident CEO. Note also that the number of total announcements given by overconfident CEOs is larger (1090) than the number of repurchases proposed by underconfident CEOs (821). These results suggest that while at the time of the announcement the stocks of the announcing firms tend to be undervalued on average, the stocks of firms with overconfident managers tend to be less so; overconfident CEOs seem to exaggerate the level of

underpricing of their firms' stocks. The larger number of announcements by overconfident CEOs also confirms this conclusion.

5.1 Announcing firms classified according to age and dividend payment status

Table 4 studies the effect of overconfidence for firms classified according to age, and dividend payment status, all related to the difficulty of valuation. Panel A divides the announcing companies according to age. For old firms, the 48-month abnormal return for overconfident firms is not statistically different from zero, while for underconfident firms the 48-month return is 14.32 percent significant at the 5 percent level. The difference of over 18 percentage points is statistically significant. For young firms, the difference in abnormal returns between the two groups of managers is considerably larger, at approximately 26 percentage points. The 48-month abnormal return for announcing firms with overconfident CEOs is 19.33 percent while for firms with underconfident CEOs the 48-month return is 45.25 percent both significant at the 5 percent level. The difference between the two groups of managers is statistically significant at the 10% level.

The abnormal returns classifying the announcing firms among dividend payers and non-payers and the level of confidence of their CEOs are presented in Panel B. Announcing firms that do not pay dividends have higher abnormal returns than dividend-paying firms. Moreover, although for both groups underconfident CEOs achieve superior returns than overconfident CEOs, the difference is larger for firms that do not pay dividends. The 48-month return for non-dividend-paying announcing firms is 36.82 percent when their CEOs are overconfident and 54.58 percent when their CEOs are underconfident, while for dividend-paying firms the 48-month abnormal returns are 10.35 percent and 18.83 percent for overconfident and underconfident CEOs respectively.

We do not report the results when we classify the announcing firms into firms with positive earnings previous announcement and firms with zero or negative earnings because there are too few observations for firms with zero or negative earnings. However, the same pattern appears. The 48-month abnormal return for firms with underconfident managements is 36.62 percent whereas when managers are overconfident the average abnormal cumulative return is 5.30 percent, although we cannot test the difference because of lack of observations.

The results of Table 4 show that when firms are more difficult to value, i.e., young firms and firms that do not distribute dividends, the stocks of firms with underconfident managers outperform the stocks of firms with overconfident managers, the difference being larger than for other firms. This is again consistent with the explanation of overconfident managers tending to overprice their stocks by a larger amount than underconfident managers, and the difference being larger when valuation is more difficult.

5.2 Announcing firms classified by previous stock return performance and book-to-market

Panel A in Table 5 reports the results of sorting the announcing firms according to their 6-month stock performance before the stock repurchase announcements. We find that when the previous stock performance is good, there is no statistically significant difference between announcements made by overconfident or underconfident managers. However, for poor previous performers, the abnormal returns for overconfident and underconfident managers are 22.70 percent and 48.09 percent respectively, the difference being significant at the 1 percent level. Panel B classifies the announcing firms according to their book-to-market ratios. While we do not find a significant difference in the cumulative abnormal returns for low book-to-market firms, we find a significant difference for firms with high book-to-market, being the 48-month abnormal return for announcing firms with overconfident CEOs 5.67 percent, and with underconfident CEOs 28.04 percent. These results are consistent with Peyer and Vermalen (2009) argument that the long-term excess returns are a correction of an overreaction to bad news by the market previous announcement. Overconfident CEOs of firms that have seen their stock prices fall in the previous six months to the announcements or overconfident CEOs of firms with high book-to-market ratios are more likely to wrongly consider their stocks to be underpriced and therefore announce a repurchase when in fact the market is correct. Underconfident CEOs, however, are more objective in their judgments of the undervaluation, and only announce when in fact their stocks are truly underpriced.

5.3 Announcing firms classified according to their financial constraints

Table 6 studies the effect of overconfidence on the abnormal returns after repurchase announcements for constrained and unconstrained firms using our four measures of financial constraints. The table shows that regardless of the financial constraints measure used, stocks of both firms with overconfident and underconfident managers earn higher post-buyback abnormal returns for firms classified as being financially constrained. A potential explanation for this result is that due to the cost of spending cash when firms are constrained, managers announce buybacks when stocks are more underpriced.

We further divide each group of constrained and unconstrained firms according to the level of confidence of the CEO of the announcing firm. For every measure of constraints used, we find that constrained firms with overconfident managers have significantly lower abnormal returns for long horizons (36 and 48 months) than firms with underconfident managers. The differences are statistically significant at the 48-month horizon when we use the Whited and Wu (2006) index and size as measures for financial constraints. In contrast, for unconstrained firms, there is not a statistically significant difference between the abnormal returns for overconfident and underconfident CEOs. These results are consistent with overconfident managers overpricing their own stocks. Financially constrained firms, where informational asymmetries are potentially large, might be more difficult to value for outsiders. Overconfident managers, who are aware of this fact, tend to disregard the information given by the market price and value their firm's stock by their personal overconfident appraisals. This implies that a number of stock repurchases announced by overconfident CEOs are based on an overvaluation of their firms' stocks and the average abnormal returns tend to be lower than for underconfident CEOs. Underconfident CEOs base their announcements on more objective valuations of their firms which also includes a careful consideration of the market price. Therefore, these underconfident managers tend to announce stock repurchases when their firms' stocks are truly undervalued. In the case of financially unconstrained companies, information asymmetries are smaller and our interpretation of the result is that overconfident managers regard the market's valuations of their firms. This reduces the differences in abnormal returns between announcements by overconfident and underconfident CEOs since now both valuations tend to approach to the real value, which at the same time is closer to the market price, as indicated by the lower abnormal returns relative to financially constrained firms.

5.4 Overconfidence and the intended buyback fraction

Table 7 shows the results of a cross-sectional regression where the dependent variable is the intended buyback fraction reported by the firms in the moment of the repurchase announcement. Intuitively, one would expect that when the CEO of a firm is overconfident, she will be less cautious about the fraction being repurchased since she is likely to price her firm's stock higher than an underconfident CEO. The coefficient of the variable *Confidence* is statistically significant at the 5 percent level and positive for every one of the six specifications. For example, using the estimated coefficient of Model 6, a firm with an overconfident CEO would announce a 1.269 percent larger buyback fraction than an underconfident CEO. This result is consistent with overconfident managers considering their stocks to be more underpriced and accordingly announcing larger fractions to be repurchased.

5.5 Robustness tests

Our benchmark measure for the degree of managers' confidence is the press-based measure. As robustness tests, we employ two additional measures, namely the options-based measure of, for example, Malmendier and Tate (2008), and Malmendier, Tate, and Yan (2011), and the gender-based measure of Barber and Odean (2001) and Niederle and Vesterlund (2007).

5.4.1 Options-based measure for managerial overconfidence

The results when using the options-based measure are presented in Table 8. Consistent with the results when employing the press-based measure in Table 3, Table 8 shows a large difference in the post-announcement abnormal returns between overconfident and underconfident managers when using the Carhart (1997) four-factor model to estimate abnormal returns. Interestingly, different from Table 3, the difference in abnormal returns is statistically significant already at the 12-month horizon, where the abnormal returns of underconfident managers are more than twice larger than those of overconfident managers. The outperformance of stocks of underconfident managers rises with the horizon in terms of economic and statistical significance, and peaks at the 48-month. At that horizon, the abnormal returns of overconfident managers are 9.25% as opposed to 27.38% for underconfident firms, both statistically significant, and the difference between the two is highly statistically significant with a z-test value of 3.45.

5.4.2 Gender-based measure for managerial overconfidence

Table 9 shows the results for the gender-based measure for managerial overconfidence. The results are largely consistent with the results in Tables 3 and 8. As seen in Panel A of Table 9, abnormal returns are on average lower when the executive teams comprise of only males. When the executive teams are mixed abnormal returns are higher for all horizons, although the differences in most of these cases are not statistically significant. The results in Panel B are similar. When both the CEOs and CFOs are males, abnormal returns are lower. Panel C presents very similar results when employing the gender of the CFO as a measure for the degree of confidence.

6. Conclusion

In this paper, we provide empirical evidence consistent with Chan, Ikenberry and Lee (2004) and Peyer and Vermaelen (2009) that the buyback anomaly is being driven by mispricing. This hypothesis suggests that the managers of announcing firms perceive their stocks to be undervalued by the market and announce a stock repurchase in order to signal the misvaluation. If this is the case, then signals sent by an overconfident manager will be less credible to the market, and we would expect to see lower cumulative abnormal returns after the announcement. If the announcement is, however, made by an underconfident manager, then the market will be more likely to believe the signal since it will probably contain more objective information, and we should see higher abnormal returns. Using a press-based measure for managerial overconfidence, we provide evidence that while positive, the post-buyback announcements abnormal returns are substantially lower when CEOs are classified as overconfident.

To further explore this finding, we divide the announcing firms according to various criteria that classify the firms by their difficulty to be valued and the likelihood of being underpriced. The underperformance of firms with overconfident CEOs is particularly strong for young, small, high book-to-market, and non-dividend paying firms all of which are difficult to value. Intuitively, when CEOs are overconfident they are likely to disregard the information given by the market price especially when valuation is difficult. However, when CEOs are underconfident, they are more cautious and carefully consider each piece of information available in their decision processes, including the market price. On the other hand, when firms are easier to value, overconfident CEOs know that the market price is based on a better quality of information, and are less likely to disregard the market price. In addition, we also find that

the difference in cumulative abnormal returns following repurchase announcements made by overconfident and underconfident CEOs is larger for those firms whose stocks have performed poorly in the 6 months previous to the announcement, and for those that have high book-to-market ratios. This suggests that overconfident CEOs tend to overvalue their own shares when they have been performing poorly and that the market does not believe the signal. On the other hand, underconfident CEOs tend to announce when they are more certain about the undervaluation of their own stock and the market rectifies its price with time. Finally, consistently with overconfident managers overpricing the stock of their firms, we find that the intended buyback fraction at announcement is larger for overconfident CEOs than for underconfident CEOs.

We challenge our results by using two other measures for overconfidence. We first use an options-based measure for managerial overconfidence. Namely, we use a longholder measure based on the CEOs' option exercise behavior (Malmendier and Tate, 2008; Malmendier, Tate, and Yan, 2011). Then, we also divide the announcing firms according to the gender of the executive team, and the gender of the CEOs and CFOs, since males have been found to exhibit a more overconfident behavior than females (Barber and Odean, 2001; Niederle and Vesterlund, 2007; Dahlbom et al., 2010). We find that the post-announcement CARs are significantly higher for underconfident managers regardless of the measure of overconfidence we use.

This paper, therefore, provides strong empirical evidence about the overreaction hypothesis driving the buyback anomaly. Moreover, we show that overconfident managers tend to overprice the stock of their firms and engage in repurchase activities that are not in the best benefit of the firm.

We also find, differently from Chen and Wang (2012), that the post-buyback performance when the announcing firms are financially constrained is higher, not lower. This is to be expected if managers require larger underpricing due to the higher cost of capital.

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Table 1. Descriptive Statistics for Announcing Firms

This table reports descriptive statistics of the sample of firms that announced stock repurchases from 1992 to 2009. Panel A reports descriptive statistics for all the firms that announced a stock repurchase in the period 1992-2009. Panels B and C report descriptive statistics for announcing firms with overconfident and underconfident CEOs respectively. Overconfidence and underconfidence are determined following the Hirshleifer, Low, and Teoh (2012) confidence indicator. Fraction sought is the initially announced repurchase ratio authorized by the board of directors. Prior 6-month return is the cumulative return of the company in the previous 6 months to the repurchase announcement. WW is the Whited and Wu (2006) index of financial constraints. Size is the market value of common equity. SA is the Hadlock and Pierce (2010) index of financial constraints. KZ is the Kaplan and Zingales (1997) index of financial constraints. BM is the ratio of the book value of equity to the market value of equity. Actual Repurchases is the total number of announcements that were actually repurchased. Actual to Announced is given by the ratio of Actual Repurchases to Total Announcements. WW, Size, SA, KZ, and BM have been winsorized at the 1% level.

Panel A: Total Announcements

Calendar year	Number of Events	Fraction Sought	Prior 6-month Returns	Average WW	Average Size	Average SA	Average KZ	Average BM	Actual Repurchases	Actual to Announced
1992	594	8.35	-2.40%	-0.27	1,555.98	-1,117.65	0.32	0.65	157	26.43%
1993	598	7.82	4.33%	-0.29	1,761.81	-1,159.99	0.22	0.62	181	30.27%
1994	1,000	7.45	-2.93%	-0.28	1,569.00	-1,191.43	0.30	0.72	249	24.90%
1995	1,087	7.16	4.85%	-0.29	2,093.87	-1,154.13	0.37	0.66	291	26.77%
1996	1,398	7.36	-0.08%	-0.30	2,599.25	-1,046.32	0.43	0.62	309	22.10%
1997	1,210	8.34	7.93%	-0.29	3,051.34	-1,011.91	0.56	0.50	209	17.27%
1998	1,855	8.32	-10.36%	-0.29	2,079.45	-866.58	0.63	0.67	228	12.29%
1999	1,474	8.60	-2.92%	-0.28	1,680.23	-1,037.18	0.67	0.84	177	12.01%
2000	795	9.01	-7.59%	-0.31	3,611.51	-1,231.15	0.61	0.88	198	24.91%
2001	640	8.57	-1.80%	-0.28	3,754.87	-1,116.99	0.63	0.66	90	14.06%
2002	476	10.38	-4.24%	-0.29	3,676.31	-1,162.84	0.48	0.73	69	14.50%
2003	490	9.63	12.16%	-0.31	4,031.08	-1,232.42	0.58	0.48	68	13.88%
2004	584	8.57	5.74%	-0.35	5,508.73	-1,342.44	0.48	0.43	81	13.87%
2005	652	8.89	4.18%	-0.36	5,721.51	-1,557.10	0.57	0.49	68	10.43%
2006	624	8.79	1.75%	-0.35	6,700.86	-1,504.04	0.47	0.46	53	8.49%
2007	985	9.02	-1.87%	-0.36	5,612.21	-1,483.76	0.48	0.61	89	9.04%
2008	1,110	9.70	-16.86%	-0.32	2,526.03	-1,150.12	0.30	1.03	78	7.03%
2009	453	10.16	-1.03%	-0.33	3,715.59	-1,209.59	0.39	0.71	33	7.28%
All	16,025	8.35	-1.68%	-0.31	3,090.87	-1,153.78	0.48	0.67	2,628	16.40%

Panel B: Announcements by Overconfident CEOs

Calendar year	Number of Events	Fraction Sought	Prior 6-month Returns	Average WW	Average Size	Average SA	Average KZ	Average BM	Actual Repurchases	Actual to Announced
1992	23	6.17	3.60%	-0.41	11,622	-2,556	-0.35	0.37	8	34.78%
1993	34	5.00	0.85%	-0.44	8,629	-2,627	-0.14	0.43	9	26.47%
1994	54	6.25	-0.73%	-0.44	10,106	-2,558	0.12	0.52	16	29.63%
1995	60	6.15	7.74%	-0.42	13,533	-2,775	0.29	0.44	24	40.00%
1996	77	6.75	4.84%	-0.46	17,052	-2,778	0.49	0.44	17	22.08%
1997	81	6.85	13.70%	-0.45	17,423	-2,725	0.44	0.36	11	13.58%
1998	95	9.52	-1.19%	-0.43	14,469	-2,380	0.64	0.39	14	14.74%
1999	75	7.02	2.44%	-0.40	11,589	-2,338	0.99	0.40	9	12.00%
2000	99	7.83	-8.45%	-0.43	16,470	-2,628	0.67	0.52	22	22.22%
2001	56	7.93	-6.10%	-0.41	17,449	-2,370	0.75	0.43	7	12.50%
2002	47	8.71	-14.87%	-0.43	19,095	-2,641	0.52	0.45	9	19.15%
2003	45	9.35	10.75%	-0.43	21,727	-2,666	0.47	0.34	6	13.33%
2004	72	14.72	3.99%	-0.45	21,058	-2,452	0.44	0.36	6	8.33%
2005	82	9.67	4.77%	-0.46	18,493	-2,617	0.57	0.40	5	6.10%
2006	91	9.32	1.59%	-0.46	21,617	-2,719	0.36	0.35	7	7.69%
2007	96	8.98	4.74%	-0.47	22,001	-2,673	0.59	0.47	8	8.33%
2008	74	14.52	-9.66%	-0.44	11,330	-2,682	0.40	0.67	0	0.00%
2009	33	11.57	21.79%	-0.44	15,093	-2,407	0.36	0.42	0	0.00%
All	1,194	8.11	1.86%	-0.44	16,556	-2,595	0.49	0.43	178	14.91%

Panel C: Announcements by Underconfident CEOs

Calendar year	Number of Events	Fraction Sought	Prior 6-month Returns	Average WW	Average Size	Average SA	Average KZ	Average BM	Actual Repurchases	Actual to Announced
1992	13	3.31	11.58%	-0.45	9,554	-2,784	0.36	0.41	5	38.46%
1993	40	4.58	11.43%	-0.40	7,079	-2,081	0.12	0.40	10	25.00%
1994	66	5.52	3.09%	-0.39	5,514	-2,137	-0.07	0.47	14	21.21%
1995	66	5.46	8.29%	-0.38	7,392	-2,096	0.32	0.43	18	27.27%
1996	75	6.84	6.35%	-0.42	10,927	-2,263	0.23	0.34	13	17.33%
1997	88	7.57	17.62%	-0.40	9,995	-2,067	0.36	0.30	15	17.05%
1998	99	7.00	-1.93%	-0.39	7,540	-1,936	0.65	0.35	11	11.11%
1999	70	7.15	7.52%	-0.37	7,757	-1,845	0.57	0.44	5	7.14%
2000	53	8.57	-1.14%	-0.41	12,467	-2,083	0.46	0.44	12	22.64%
2001	34	10.32	-6.54%	-0.43	14,872	-2,333	0.67	0.37	5	14.71%
2002	21	6.41	1.77%	-0.41	11,907	-2,294	0.24	0.44	2	9.52%
2003	19	6.50	21.21%	-0.41	10,419	-2,213	0.66	0.38	0	0.00%
2004	33	7.83	8.02%	-0.44	12,716	-2,491	0.21	0.38	6	18.18%
2005	45	14.39	4.18%	-0.44	11,195	-2,527	0.52	0.43	3	6.67%
2006	37	5.87	0.23%	-0.44	14,108	-2,443	0.28	0.45	4	10.81%
2007	72	10.64	1.50%	-0.45	14,544	-2,488	0.32	0.49	3	4.17%
2008	48	12.53	-11.18%	-0.46	13,828	-2,613	0.31	0.71	4	8.33%
2009	20	9.12	6.57%	-0.48	21,682	-2,782	0.08	0.42	1	5.00%
All	899	7.12	4.63%	-0.41	10,440	-2,220	0.37	0.42	131	14.57%

Table 2.Descriptive statistics for non-announcing firms

This table reports descriptive statistics of firms that did not announce a stock repurchase from 1992 to 2009. WW is the Whited and Wu (2006) index of financial constraints. Size is the market value of common equity. SA is the Hadlock and Pierce (2010) index of financial constraints. KZ index is the Kaplan and Zingales (1997) index of financial constraints. BM is the ratio of the book value of equity to the market value of equity. WW, Size, SA, KZ, and BM have been winsorized at the 1% level.

Calendar year	Number of firms	Average WW	Average size	Average SA	Average KZ	Average BM
1992	1,071	-0.17	296	-749	1.08	0.48
1993	1,352	-0.20	304	-529	1.05	0.48
1994	1,235	-0.19	351	-448	0.90	0.56
1995	1,089	-0.19	537	-405	1.07	0.44
1996	1,454	-0.21	546	-349	0.86	0.43
1997	1,215	-0.23	857	-467	1.15	0.41
1998	952	-0.23	930	-602	1.14	0.60
1999	1,231	-0.21	2,335	-563	1.30	0.43
2000	1,100	-0.22	2,017	-559	0.91	0.76
2001	514	-0.26	3,218	-977	0.88	0.69
2002	490	-0.26	2,086	-1,063	0.85	0.70
2003	445	-0.29	2,356	-1,224	0.40	0.46
2004	576	-0.27	2,024	-862	0.62	0.42
2005	572	-0.29	1,821	- 891	0.72	0.42
2006	557	-0.33	2,798	-852	0.50	0.41
2007	580	-0.28	1,423	-777	0.58	0.50
2008	269	-0.28	1,200	-712	0.54	1.13
2009	258	-0.26	1,513	-698	0.73	0.66
All years	14,960	-0.23	1,259	-624	0.95	0.52

Table 3. Long-run abnormal return after open repurchase announcements divided by CEO confidence

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model with the addition of momentum, for the firms that announced and open repurchase. First, the regression is done for the full sample, with the only condition that another announcement had not taken place in the previous month. Then, the sample is divided into 2 groups according to whether their CEOs are classified as overconfident or underconfident following the Hirshleifer, Low, and Teoh (2012) overconfidence indicator. Difference z-test is the one-tailed z-test for the difference between the overconfidence estimates and the underconfidence estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

	Full sample		Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	z-test
			Panel A: 4 Factors				
(+1.+12)	5.69%	13.27***	5.77%	4.85***	6.26%	4.96***	-0.28
(+1,+24)	12.69%	19.83***	13.17%	7.49***	13.50%	6.88***	-0.12
(+1,+36)	19.46%	23.39***	16.48%	7.49***	21.67%	8.44***	-1.54+
(+1,+48)	25.12%	24.92***	17.39%	6.55***	27.80%	8.88***	-2.53**+++
Obs	14,027		1,090		821		

Table 4. Long-run abnormal returns by age, dividend payment status, and CEO confidence

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model, with momentum as an additional factor, for the firms that announced and open repurchase. In Panel A, firms are divided into two groups depending on their age, measured by the number of months the firms had appeared at CRSP previous the repurchase announcement. 242 months is the 90 percentile conditional on having confidence information. 71 months is the 10 percentile conditional on having confidence information. Then, each subsample is divided into 2 groups according to whether the CEOs are classified as overconfident or underconfident following the Hirshleifer, Low, and Teoh (2012) overconfidence indicator. Panel B divides firms into two groups depending on whether they paid dividends in the previous year to the repurchase announcement or not. Each subgroup is further divided by CEO confidence. Difference z-test is the one-tailed z-test for the difference between overconfident CEO and underconfident CEO estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

Panel A: Long-run abnormal returns by age and CEO confidence

	Old Firms≥242 months					Young Firms ≤ 71 months				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	0.69%	0.31	0.91%	0.38	-0.06	8.72%	1.96**	13.34%	2.92***	-0.73
(+1,+24)	2.90%	0.94	4.30%	1.11	-0.28	20.12%	3.07***	28.42%	3.95***	-0.85
(+1,+36)	-0.92%	-0.25	8.53%	1.60*	-1.45+	22.34%	2.71***	38.44%	3.83***	-1.24
(+1,+48)	-4.12%	-0.94	14.32%	2.11**	-0.28**++	19.33%	2.03**	45.25%	3.82***	-1.70*++
Obs	326		175			92		98		

Panel B: Long-run abnormal returns by dividends and CEO confidence

	Dividends					No dividends				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	2.37%	2.00**	2.68%	2.11**	-0.74	15.63%	4.99***	15.23%	4.50***	0.08
(+1,+24)	7.89%	4.37***	9.04%	4.60***	-0.43	28.64%	6.51***	25.56%	4.80***	0.45
(+1,+36)	8.69%	3.78***	15.24%	5.90***	-1.89*++	37.09%	6.96***	40.30%	5.80***	-0.37
(+1,+48)	10.35%	3.64***	18.83%	5.84***	-1.97**++	36.82%	5.90***	54.58%	6.69***	-1.73*++
Obs	788		613			278		186		

Table 5. Long-run abnormal return by past performance, book-to-market, and CEO confidence

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model with momentum as an additional factor, for the firms that announced and open repurchase. Panel A divides firms into two groups depending on the previous 6-month performance of their stock. A firm is classified as a good previous performer if its cumulative return for the 6 months before an announcement is above the 75 percentile of all the firms that announced a stock repurchase. A firm is classified as a bad performer if its cumulative return for the previous 6 months to an announcement is below the 25 percentile of all the firms that announced a repurchase. Panel B divides firms into two groups depending on the BM-ratio in the year before the announcement. A firm is classified as having a high BM-ratio if, in the year before the announcement, it is above the 75 percentile of all the firms that announced repurchases. A firm is classified as a low BM if, in the previous year to an announcement, its BM is below the 25 percentile of all the firms that announced repurchases. BM is defined as the ratio of the market value of assets to the book value of assets where the market value of assets is calculated as the book value of assets minus the book value of common equity plus the market value of common equity. The variable was winsorized at the 1% level in each tail. Then, each subsample is divided into 2 groups according to whether the CEOs are classified as overconfident or underconfident following the Hirshleifer, Low, and Teoh (2012) overconfidence indicator. Difference z-test is the one-tailed z-test for the difference between the overconfident CEO and underconfident CEO estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

Panel A: Long-run abnormal return by previous six-month performance and confidence

	Poor Previous 6-month Performers					Good Previous 6-month Performers				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	9.12%	2.88***	9.06%	2.86***	0.01	6.64%	2.51***	7.65%	2.85***	-0.27
(+1,+24)	21.74%	4.81***	23.19%	4.49***	-0.21	11.83%	3.00***	13.68%	3.42***	-0.33
(+1,+36)	27.99%	5.27***	37.26%	5.58***	-1.09	13.86%	2.86***	19.11%	3.75***	-0.75
(+1,+48)	22.70%	3.70***	48.09%	6.20***	-2.57**+++	20.63%	6.61***	23.32%	3.74***	-0.32
Obs	282		180			240		215		

Panel B: Long-run abnormal return by BM and CEO confidence

	High BM					Low BM				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	2.40%	0.83	4.73%	-0.62	-0.62	10.64%	4.60***	11.31%	3.98***	-0.18
(+1,+24)	8.77%	2.08**	15.53%	-1.16	-1.15	18.97%	5.91***	17.97%	4.27***	0.19
(+1,+36)	10.21%	1.97**	24.82%	-1.98**	-1.98**++	26.14%	6.48***	26.60%	5.02***	-0.07
(+1,+48)	5.67%	0.90	28.04%	-2.50**	-2.50**+++	28.50%	6.12***	31.05%	4.79***	-0.32
Obs	256		202			283		186		

Table 6. Long-run abnormal return by financial constraints, and CEO confidence

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model with momentum as an additional factor, for the firms that announced and open repurchase. Firms are divided into financially constrained and financially unconstrained. A firm is classified as constrained if it belonged to the top 25 percentile of the Whited and Wu (2006) index (Panel A), to the lowest 25 percentile according to size (Panel B), to the top 25 percentile of the size and age Hadlock and Pierce (2010) index (Panel C), or top 25 percentile in the Kaplan and Zingales (1997) index (Panel D) in the previous year to the announcement, and as unconstrained if it belonged to any other percentile for the Whited and Wu, the size and age Hadlock and Pierce, and the Kaplan and Zingales indexes, or if the firm belonged to the top 25 percentile in size. The indexes have been winsorized at the 1% level of their distributions to avoid the effects of extreme values. Size is defined as the market value of common equity in the previous year to the announcement. Then, each subsample is divided into 2 groups according to whether the CEOs are classified as overconfident or underconfident following the Hirshleifer, Low, and Teoh (2012) overconfidence indicator. Difference z-test is the one-tailed z-test for the difference between the overconfident CEO and underconfident CEO estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

	Financially Constrained					Financially Unconstrained				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
Panel A: 4 Financial constraints measured by WW index										
(+1.+12)	14.95%	4.23***	13.00%	4.11***	0.41	4.21%	3.28***	3.34%	2.27***	0.45
(+1,+24)	26.82%	5.40***	22.82%	4.79***	0.58	9.63%	4.98***	9.28%	3.98***	0.12
(+1,+36)	29.85%	4.83***	38.75%	6.23***	-1.01	12.92%	5.31***	14.40%	4.69***	-0.38
(+1,+48)	32.09%	4.35***	54.11%	7.51***	-2.14**++	14.05%	4.74***	17.70%	4.50***	-0.74
Obs	199		213			783		465		
Panel B: 4 Financial constraints measured by Size										
(+1.+12)	13.35%	3.52***	7.72%	2.88***	1.21	3.12%	1.61*	6.53%	2.59***	-1.07
(+1,+24)	27.71%	5.29***	17.59%	4.29***	1.52+	6.64%	2.31**	10.44%	2.76***	-0.8
(+1,+36)	26.01%	4.02***	30.40%	5.67***	-0.52	8.76%	2.48***	14.29%	2.98***	-0.93
(+1,+48)	23.41%	3.08***	43.37%	6.83***	-2.01**++	9.80%	2.36***	16.14%	2.70***	-0.87
Obs	199		263			328		143		

	Financially Constrained					Financially Unconstrained				
	Overconfident CEO		Underconfident CEO		Difference	Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test	CAR	t-statistic	CAR	t-statistic	z-test
Panel C: Financial constraints measured by SA index										
(+1.+12)	15.08%	4.50***	9.94%	3.75***	1.2	4.47%	3.49***	3.83%	2.86***	0.34
(+1,+24)	27.39%	5.67***	19.07%	4.79***	1.33+	10.40%	5.53***	9.58%	4.45***	0.29
(+1,+36)	29.65%	4.89***	32.14%	6.17***	-0.31	13.75%	5.86***	14.99%	5.36***	-0.34
(+1,+48)	32.09%	4.40***	45.10%	7.34***	-1.37+	14.46%	5.08***	17.39%	4.96***	-0.65
Obs	193		273			874		528		
Panel D: 4 Financial constraints measured by KZ index										
(+1.+12)	9.68%	3.19***	4.56%	1.27	1.09	5.58%	4.19***	6.48%	4.29***	-0.45
(+1,+24)	15.98%	3.81***	19.73%	3.55***	-0.54	12.89%	6.27***	11.72%	5.02***	0.38
(+1,+36)	21.20%	3.98***	27.97%	4.12***	-0.78	16.60%	6.46***	19.63%	6.15***	-0.74
(+1,+48)	17.69%	2.71***	32.97%	4.15***	-1.49+	19.22%	6.21***	26.67%	6.71***	-1.48+
Obs	258		151			699		522		

Table 7. Cross-sectional regression analyses of the intended buyback fraction

This table examines whether firms with overconfident CEOs announce a higher intended buyback fraction than firms with underconfident CEOs. The variable *Confidence* takes the value of 1 if a CEO is classified as overconfident, and 0 if a CEO is classified as underconfident following the Hirshleifer, Low, and Teoh (2012) overconfidence indicator. Size is defined as the market value of common equity. BM is defined as the ratio of the market value of equity to the book value of equity. Prior return is the 6-month cumulative return for the 6 months preceding the announcement. Profitability is defined as the ratio of income before extraordinary items plus depreciation and amortization to shareholders equity plus balance sheet deferred taxes. Div/BE is the ratio of total dividends to booked equity defined as the shareholders' equity plus balance sheet deferred taxes. All the independent variables with the exception of Confidence, have been lagged one period. Size, BM, Profitability and Div/BE have been winsorized at the 1% level. The sample period is 1992 to 2009. The estimation method is pooled OLS with standard errors clustered at the firm level. The t-statistics are reported in brackets under each coefficient. ***, **, and * represent 1%, 5% and 10% significance level respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	6.917	7.166	6.563	6.435	6.212	6.289
	(18.88***)	(18.41***)	(13.32***)	(12.93***)	(12.24***)	(11.72***)
Confidence	1.138	1.377	1.327	1.448	1.295	1.269
	(1.95*)	(2.21**)	(2.11**)	(2.22**)	(1.76*)	(1.73*)
Size		-0.000035	-0.000026	-0.000026	-0.000018	-0.000016
		(-1.48)	(-1.12)	(-1.09)	(-0.56)	(-0.48)
BM			1.325	1.377	1.515	1.381
			(1.37)	(1.40)	(1.43)	(1.31)
Prior Return				0.232	-0.088	-0.081
				(0.22)	(-0.07)	(-0.07)
Profitability					0.592	0.751
					(0.90)	(1.07)
Div/BE						-1.787
						(-0.32)
N	923	912	912	885	705	704
R^2	0.0044	0.0069	0.0525	0.0097	0.0084	0.008
Adjusted R^2	0.0033	0.0047	0.0053	0.0052	0.0013	0.0005

Table 8. Long-run abnormal returns divided by CEO confidence as measured by the Malmendier and Tate (2005) confidence indicator

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model with the addition of momentum, for the firms that announced and open repurchase. First, the regression is done for the full sample, with the only condition that another announcement had not taken place in the previous month. Then, the sample is divided into 2 groups according to whether their CEOs are classified as overconfident or underconfident following the Malmendier and Tate (2005) overconfidence measure. Difference z-test is the one-tailed z-test for the difference between the overconfident CEO and the underconfident CEO estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

	Full sample		Overconfident CEO		Underconfident CEO		Difference
Months	CAR	t-statistic	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	5.69%	13.27***	3.54%	1.96**	7.98%	7.85***	-2.15**++
(+1,+24)	12.69%	19.83***	6.60%	2.30**	15.36%	10.96***	-2.74***+++
(+1,+36)	19.46%	23.39***	7.27%	1.91*	21.17%	11.84***	-3.31***+++
(+1,+48)	25.12%	24.92***	9.25%	1.94*	27.38%	12.48***	-3.45***+++
Obs	14,027		619		1,903		

Table 9. Long-run abnormal return after open repurchase announcements divided by gender

This table reports cumulative average abnormal returns (CAR) in percent using Ibbotson's (1975) returns across time and security (IRATS) method combined with the Fama-French (1993) three-factor model with the addition of momentum, for the firms that announced and open repurchase. Panel A divides the announcing firms into 2 groups according to whether all the executives were males (All Males) or there were females on the executive team. Panel B divides the announcing firms into 2 groups according to whether both, the CEO and the CFO are males (Male CEO and CFO) or at least one of them is a female (No male CEO or CFO). Panel C divides the announcing firms into 2 groups according to whether the CFO is a male or a female. Difference z-test is the one-tailed z-test for the difference between the high confidence estimates and the low confidence estimates. The sample period is 1992 to 2009. ***, **, and * represent 1%, 5% and 10% significance level respectively. For the difference z-test, * indicates significance in a two-tail test, and + significance in a one-tail test.

Panel A: By Gender of the Executive Team

	All Males		Mixed Board		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	5.52%	8.94***	6.07%	4.75***	-0.39
(+1,+24)	11.90%	12.91***	12.37%	6.96***	-0.24
(+1,+36)	16.75%	13.98***	18.85%	8.27***	-0.82
(+1,+48)	20.74%	14.12***	24.96%	9.08***	-1.35+
Obs	4,250		1,533		

Panel B: By Gender of CEO and CFO

	Male CEO and CFO		No Male CEO or CFO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	5.05%	7.71***	11.27%	3.33***	-1.80*++
(+1,+24)	11.27%	11.48***	18.93%	4.36***	-1.72*++
(+1,+36)	16.77%	12.97***	21.37%	4.11***	-0.86
(+1,+48)	21.37%	13.30***	25.68%	4.21***	-0.68
Obs	4,084		397		

Panel C: By Gender of CFO

	Male CFO		Female CFO		Difference
Months	CAR	t-statistic	CAR	t-statistic	z-test
(+1.+12)	5.03%	7.68***	12.75%	3.25***	-1.94*++
(+1,+24)	11.14%	11.37***	21.51%	4.42***	-2.09**++
(+1,+36)	16.72%	12.97***	22.11%	3.84***	-0.91
(+1,+48)	21.31%	13.33***	26.45%	3.91***	-0.74
Obs	4,164		317		